

## A NEW SPECIES OF LERNAEA (PARASITIC COPEPODA) FROM THE GOLDFISH.

WILBUR M. TIDD,  
Ohio State University.

In the summer of 1930 some goldfish were sent to the author for examination by the proprietor of a goldfish farm in the southern part of Ohio. Examination revealed the presence of a number of parasitic copepods anchored firmly in the flesh of the fish. These parasites undoubtedly belong in the genus *Lernaea*, but a subsequent search of the literature has not revealed a species of this group to which they may be referred.

These parasites were first noted in the goldfish ponds in the summer of 1929. In 1930 three of the ponds were badly infested and the proprietor stated that almost every fish taken from them carried one or more of the parasites. In 1931 the infestation decreased considerably. Throughout the summer of 1932 parasites were found from time to time upon the fish and the degree of infestation roughly approximated that of the preceding summer.

This is the second time *Lernaea* has been reported as occurring upon goldfish. Enders and Rifenburgh (1928) reported a similar infestation at one of the large fish hatcheries in Indiana. They gave a brief description of the parasite with a few of the early stages in its life history. However, they did not refer it to any known species or describe it as a new one.

*Lernaea carassii*,<sup>1</sup> new species.

The type and paratypes of this species have been deposited in the United States National Museum and are recorded under catalogue numbers 67460 and 67461 respectively.

*Female*.—This species is characterized by the number and arrangement of the horns which arise from the cephalothorax and serve to anchor the parasite in the flesh of its host. The dorsal pair of horns (Fig. 1) fork distally into two unequal rami, the longer of the two continues at a slight angle to the

---

<sup>1</sup>Named after its host, *Carassius auratus*.

base of the horn, while the shorter one bends posteriorly and forms an angle with the first. These rami may be blunt or sharply pointed at their free ends. Occasionally a specimen is found in which one of the shorter rami is merely a small tubercle, making the dorsal horns unsymmetrical. The ventral horns are conical, slender, and sharply pointed. They usually curve toward the ventral surface of the body.

The free-thorax (Fig. 1) is slender in the region of the second pair of legs and gradually enlarges posteriorly. It is obscurely segmented and usually flexed in the region where it projects from the flesh of its host. Reference to the position of the egg sacks, pregenital prominence, and feet shows that the free thorax has undergone a rotation to the right, upon its longitudinal axis, thus carrying the egg sacks through an angle of approximately 90 degrees. Wilson (1917a) explained this phenomenon of twisting, or torsion, as being produced by the parasite twisting upon its longitudinal axis as it burrowed into the tissue of its host.

The pregenital prominence is usually well marked, simple or bilobed. The abdomen is conical, slightly upturned, and ends in two small anal liminae, each of which is armed with a long plumose seta, with two non-plumose setae on the outer margin.

As shown in Figure 3 the head is circular with a blunt rostrum projecting from the center of the anterior margin. The first antennae contain four joints, the second joint being the longest, all joints are heavily armed with setae on the anterior margin. Second antennae two jointed, the first joint being much the longest and unarmed. The terminal one ends in a curved claw, one large seta and two short ones, with three short setae along the inner margin. Second maxillae with two claws of almost equal size; maxillipedes two jointed, the basal joint unarmed, the terminal joint ending in five claws, near the base of these is a blunt process and immediately behind this is located a second and somewhat smaller process which is tipped with a minute seta.

The five pairs of swimming legs (Figs. 4-8) are quite typical for those of the genus as described by Wilson (1917b). Each of the first four pairs of legs consists of a broad basopodite and two three-jointed rami, each of which is armed with spines and long plumose setae. The small fifth legs (Figs. 2 and 8) are located immediately posterior to the pregenital prominence.

The egg sacks are long and narrow, and about one-third the length of the body; each sack carries about one hundred and eighty eggs. When ready to hatch the eggs are of a light green color.

The color of specimens preserved in a solution of five percent formalin and ninety-five percent alcohol, mixed half and half, is a grayish white. Young living specimens are a pale green, while old living specimens are a light brown color, and are often covered with a dense growth of a stalked protozoon, among which algae collect, giving the parasite the appearance of a piece of dirty string adhering to the fish.

Twenty-five specimens have been used in the above description. The following measurements are averages derived from the measurement of ten specimens carrying egg sacks. Body length (excluding horns and egg sacks) 9.78 mm., range 7.33 to 11.70 mm.; greatest diameter 0.50 mm., range 0.40 to 0.81 mm.; length across dorsal horns from tip to tip 3.16 mm., range 1.74 to 4.05 mm.; length of ventral horn 0.50 mm., range 0.40 to 0.58 mm.; diameter of egg sacks 0.25 mm., range 0.18 to 0.36 mm.

While these parasites are usually attached at the base of the fins a number have been found attached in the nostrils and over practically all other parts of the body. The depth at which the cephalothorax is buried in the flesh varies from just beneath the integument to a penetration of the body wall by one of the horns in such a manner that it comes to lie inside the body cavity in contact with the viscera. Quite often the flesh of the fish surrounding the horns swells up in a tumor-like growth, and the horns working about in this lump keeps it irritated and bleeding. When the parasite is removed from the tumor-like growth the horns and head are often found to be covered with a tough tissue which is very difficult to remove.

Frog tadpoles have been found, at the goldfish farm, which were carrying the adult parasites. In the laboratory the tadpoles of *Rana* species have been parasitized by introducing them into aquaria with goldfish which were carrying the larvae of the copepods upon their gill filaments. The region of the tadpole's hind legs seems to be the chief point of attachment. The mortality among these parasitized tadpoles is unusually high.

## REMARKS.

In the arrangement of the horns this species is quite similar to an African species, *Lernaea temnocephala* Cunningham (1914), which was found upon *Barbus bynni*, a fish of the River Nile. While we know nothing of the appendages or egg sacks of *temnocephala*, as the description of the species was based upon a single, poorly preserved specimen, still from the author's description of the disposition of the horns it would seem to be very similar to the species described above. However, the dorsal horns of *temnocephala* end in rounded lobes and are not pointed, also *temnocephala* is said by Cunningham to lack evidence of segmentation, and the abdomen is parallel with the body axis, characters which will hardly fit the specimens under consideration.

## LITERATURE CITED.

- Cunnington, W. A. 1914. Proceedings, Zoological Society of London, pp. 827-828; pl. I, Figs. 8, 9.
- Enders, H. E., and Rifenburgh, S. A. 1928. A Preliminary Report on *Lernaea*, a Copepod Parasite on the Goldfish. Proceedings of the Indiana Academy of Science, Vol. 38, pp. 333-334.
- Wilson, Charles Branch. 1917a. North American Parasitic Copepods belonging to the Lernaeidae with a Revision of the Entire Family. United States National Museum, Vol. 53, pp. 1-50.
- 1917b. The Economic Relations, Anatomy and Life History of the Genus *Lernaea*. United States Bureau of Fisheries, Vol. XXXV, pp. 165-198. Document No. 856.

## EXPLANATION OF PLATE.

(All drawings were made from preserved specimens with the aid of the camera lucida.)

- Fig. 1. Ventral view of female of *Lernaea carassii*.
- Fig. 2. Ventral view of abdomen and pregenital prominence.
- Fig. 3. Head and mouth parts: an<sup>1</sup>, first antennae; an<sup>2</sup>, second antennae; mx, second maxillae; mxp, maxillipedes; r, rostrum; h, head.
- Figs. 4-8. First, second, third, fourth, and fifth swimming legs.

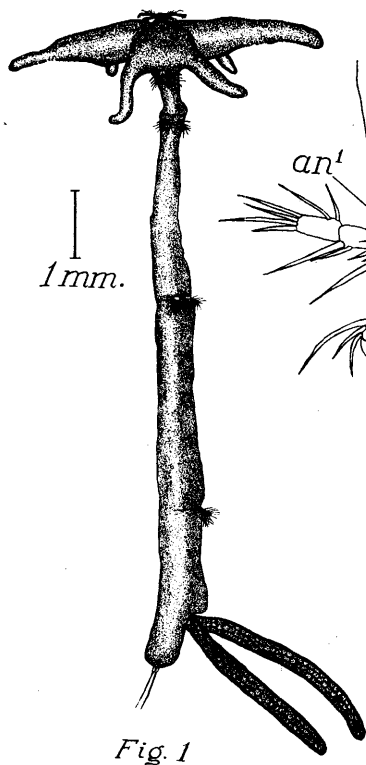


Fig. 1

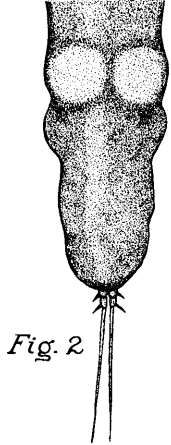


Fig. 2

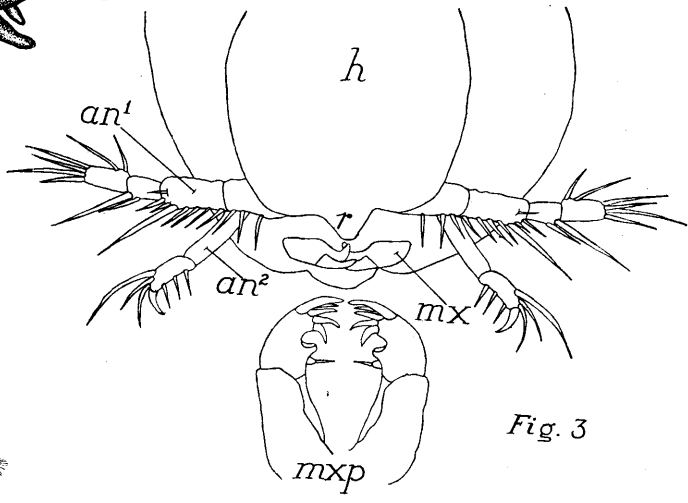


Fig. 3



Fig. 4



Fig. 5

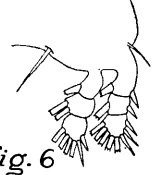


Fig. 6



Fig. 8

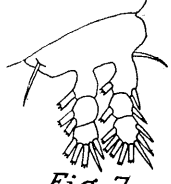


Fig. 7

## BOOK NOTICES

---

### Fossil Plants.

The first paper of this publication, by Dorf, deals with the Pliocene flora of California. From some 16 scattered localities in California, of Pliocene age, are described some 34 species of fossil plants, distributed among 26 genera, of which *Quercus* is most abundant with 5 species. Of these 34 species, 8 are too poor to determine, 5 have been previously described, and 21 are described as new. The beds containing these plant remains are most abundant in the lower Pliocene and least abundant in middle Pliocene with an intermediate abundance in upper Pliocene. The close relationship of the present flora is well shown, details differing, however. The change from uniform Miocene climate to the diversified Pliocene is well expressed in this flora. Already there is evidence of climatic and physical barriers between the eastern and western North American floras.

The second paper, by Webber, deals with woods from the Ricardo Pliocene of Last Chance Gulch, California. Five genera of petrified wood are described from this Pliocene locality. There are four generic and specifically determinable fossils and one which can only be determined generically. One undetermined dicotyledon is recorded. These fossils show that the Mohave Desert region was less arid during the Pliocene. It is hoped that this useful paper will lead to more work on Pliocene woods.—WILLARD BERRY.

**Studies of the Pliocene Paleobotany of California.** I. Pliocene Flora of California, by Erling Dorf, pp. 1-112. II. Woods from the Ricardo Pliocene of Last Chance Gulch, California, by Irma E. Webber, pp. 113-134. Publication No. 412, Carnegie Institution of Washington, 1933.

---

### Alcoholic Fermentation.

The author (see Arthur Harden, Nobel Laureate, 1929) has in this present edition more than doubled the size compared with the original edition of 1910. This book is apparently not "some brewers' handbook," but rather a detailed scientific discussion of the principles and theories involved in the fermentation processes. A general knowledge of Organic Chemistry, Physiological Chemistry or Bacteriology is essential to the proper understanding of this work. In addition to the description of the author's own investigation in this field there is included a very good survey of the work of other authors and an excellent bibliography (38 p.) of the literature up to the last of 1931.—WALLACE R. BRODE.

**Alcoholic Fermentation**, by Arthur Harden. Fourth edition, revised, 237 pp. New York, Longmans Green and Co., 1933.

---

### Fresh-Water Algae.

American algologists have waited a long time for a comprehensive report on the algae of the United States that would be comparable to West and Fritsch: "British Freshwater Algae." Their patience has been rewarded in Smith's volume. The introduction discusses the ecology, methods of collecting, and recent evolutionary theories regarding the development of the freshwater algae. The morphology, reproduction, and taxonomy of all genera found in the United States, together with brief characteristics of the important species, occur. Each genus is illustrated by one or more original drawings. Amateurs will find especially helpful and comprehensive key to all genera, based on vegetative characters. The classes of algae discussed are Myxophyceae, Rhodophyceae, Heterokontae, Chrysophyceae, Bacillariae, Chlorophyceae, Dinophyceae and Euglenophyceae. Students of the algae will find the book indispensable.—L. H. TIFFANY.

**The Fresh-water Alga of the United States**, by Gilbert M. Smith. 716 pp., 449 illus. New York, the McGraw-Hill Co., 1933.